Effectiveness of Automated Tumor-feeder Detection Software (ATDS) using CT arteriography images in super-selective transcatheter arterial chemoembolization (TACE) for hepatocellular carcinoma

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Learning objectives

Automated Tumor-feeder Detection Software (ATDS)

1. What is
2. How to use
3. How useful is

in super-selective transcatheter arterial chemoembolization (TACE) for Hepatocellular carcinoma (HCC)
Super-selective TACE for HCC

**Super-selective TACE** is an effective therapeutic options for inoperable small HCC [1-2].

Identification of the tumor-feeder is **crucial** for super-selective TACE.

Defined as TACE at **the most distal portion** of the hepatic artery.

Super-selective catheterization at **the most distal portion of a tumor-feeder** are essential for this technique.
Identification of the tumor-feeder

**Angiography & Digital subtraction angiography (DSA)**
- Standard technique
- Sometimes cannot demonstrate the tumor-feeder especially of a small HCC

**ATDS using CTHA images**
- Recently reported
- Tumor-feeder detectability rates are reported to be about 85-90%
- Specific flat panel detector angiographic system is necessary

**ATDS using cone-beam CT hepatic arteriography (CBCTHA) images**
- Recently developed
- May have the same or better detectability compared to ATDS using CBCTHA
- Cannot need special CT machines

**ATDS using CT hepatic arteriography (CTHA) images**
- Recently developed
- May have the same or better detectability compared to ATDS using CBCTHA
- Cannot need special CT machines
Our system

ATDS software
Embolization Plan (CANON MEDICAL SYSTEMS, Ohtawara, Japan)

Angio-CT
INFX-8000C/ Acquilion 16 (CANON MEDICAL SYSTEMS, Ohtawara, Japan)

ATDS
Angio-CT
Monitor in the operation room

It doesn't have to be Angio-CT. You can use general-purpose CT to perform CTHA.
CTHA protocol

Contrast media injection

Image acquisition

<table>
<thead>
<tr>
<th>1st phase</th>
<th>2nd phase</th>
<th>3rd phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>For feeder analysis &amp; VR generation</td>
<td>Reference images for tumor marking (assess early enhancement)</td>
<td>Assess corona enhancement</td>
</tr>
</tbody>
</table>

Contrast media injection:
- Catheter diameter: 5 F.
- Catheter tip position: Celiac a.
- Contrast media: 300 mgI/ml
- Slice thickness/interval: 1/1 mm

Contrast media injection:
- 3ml/sec from celiac a.

Image acquisition:
- Single breath hold
Only **2 steps** to detect & visualize tumor-feeders

1. Mark the tumor with margin on CTHA images (red circle)
2. Mark the virtual catheter tip on CTHA images (orange cross)

Result: Tumor-feeders are mapping on VR images (red line)

**within 30 seconds**

Can change the angle as you like
Case 1: small HCC in S7

Gd-EOB-DTPA enhanced MRI showed a small HCC (7mm) at S7 (orange arrow).

DSA from celiac a. could not show the tumor and tumor-feeder.

ATDS using CTHA detected a small branch of A7 as a tumor-feeder (red line).
Case 1: small HCC in S7

Achieved super-selective TACE with ATDS using CTHA images

Decided the working-angle on the ATDS image (orange box)

Chemoembolization was performed from the detected artery

CT after embolization showed dense Lipiodol accumulation in the tumor (orange arrow)
Case 2: multiple HCCs in S7 & S4

CTHA showed multiple HCCs (orange arrows).

ATDS detected the tumor-feeders. Chemoembolization was performed from the arteries. (color lines)

CT showed dense Lipiodol accumulation in the tumors.

Achieved super-selective TACE with ATDS using CTHA images.
Conclusions

• ATDS using CTHA images is useful for super-selective TACE for HCC.

• A further study is needed to assess the accuracy of detected tumor-feeders by ATDS using CTHA images.


